Foldable Transportable Multiple Function Pilates Exercise Apparatus and Method

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FIELD OF THE INVENTION

This invention relates generally to the field of Pilates exercise equipment and more particularly to a machine which combines three Pilates exercise systems- reformer, pole, and mat in one footprint, and which may be folded into an upright position for storage and rolled for relocation.

BACKGROUND

A Pilates reformer exercise apparatus typically includes a wheeled platform carriage which rides on parallel rails or tracks on a rectangular wooden or metal frame. Most devices employ a series of parallel springs or elastic members which connect the carriage to the foot end of the frame. The springs are manually interchangeable in order to provide a variable resistance.

The carriage typically includes stationary shoulder pads and a head rest. It is desirable to be able to convert the carriage with its raised shoulder pads and a head rest into a flat surface.

A foot bar is located at the foot end of the device so that the user can press one or both feet against the foot bar and push the carriage against the spring resistance. Adjusting the position of the carriage in relation to the foot bar is important to accommodate different body types, and is typically accomplished by manually moving a spring bar into different gear settings at the foot end of the reformer or by adjusting the foot bar position. It is desirable to provide a simple mechanism which allows for gear adjustment without requiring the user to interrupt the flow of exercise to make the necessary adjustment.

Pulleys are often located at the head end of the reformer frame. The pulleys, may be adjustable in height during exercises where the user pulls the carriage by means of a rope or strap threaded through the pulley. It is desirable to provide a fully articulating swivel pulley, thereby enabling the user to pull the carriage through its entire path without binding or dragging. It is also desirable to allow the user to adjust the height position of the pulley, and to lower the pulleys to a height below the reformer rails.

Reformers are usually over 7 feet in length, and commercial models exist either as stationary units, or stackable units. The stationary units are difficult, impractical or time-consuming to move. Wheels have been added to the legs of such stationary units, but are of limited value, as they are bulky and ungainly to move, while the large amount of space required for the footprint of the unit remains the same. Stackable units typically require at least two persons to break down and stack in another location, or on a rolling cart, which then is wheeled to another location. It is, therefore, desirable to provide a device that can be folded into a minimal, space-saving footprint, which can be transported, if desired, by one individual.

It is desirable from the standpoint of economy of cost and space to provide a integrated Pilates machine which combines three Pilates machines- reformer, pole system and mat in one footprint, thus enabling the user to perform in this one machine most of the exercises in the full Pilates repertoire. In the current invention, the user can with no or very little compromise, and with ease of transition, perform exercises in the reformer mode, the pole system mode, and in a mat flat padded platform mode.

The present invention provides an attractive, durable, versatile, space-saving, and cost-saving commercial Pilates machine, which may be easily folded in to a minimal footprint and transported and stored out of the way.

SUMMARY OF THE INVENTION

The current invention features an improved Pilates machine. One embodiment of the invention includes an integrated piece of equipment which combines three Pilates machines-reformer, pole system and mat in one footprint, thus enabling the user to perform in this one machine up to 90% of the exercises of Pilates repertoire. The user can, with virtually no compromise, and with ease of transition, perform exercises in the reformer mode, the pole system mode, and a mat flat padded platform mode. The invention includes the hinging of a professional-grade, heavy duty frame, so that the machine may be folded into an upright position; and a wheeled base, so that the folded upright machine may be wheeled to various locations for storage. A counterbalance is provided to assist in folding and unfolding the machine. A hinged carriage is provided to facilitate conversion from reformer mode to mat mode. A single hand gear changing mechanism is provided, enabling the user to easily change the gear positions of the reformer with a simple single motion, without requiring the user to interrupt the flow of exercise by getting off the reformer to make the necessary adjustment. A fully articulating swivel pulley which may be rotated and lowered below the rails is provided.

BRIEF DESCRIPTION OF THE DRAWINGS

The current invention may be more easily understood, and its benefits would become more apparent, with the viewing of the following figures:

FIG. 1 is a perspective view of a reformer in an extended position.

FIG. 2 is a side view of a reformer in a folded position.

FIG. 3 is a detail of a left rail.

FIG. 4 is a perspective view of detail of the head base.

FIG. 5 is a perspective view of detail of the head cross member and the foot cross member.

FIG. 6 is a perspective view of the torsion spring counterbalance mechanism.

FIG. 7A is a perspective view of the footbar assembly.

FIG. 7B is a side view of the footbar assembly.

FIG. 8A is a top perspective view of the carriage.

FIG. 8B is a bottom perspective view of the carriage.

FIG. 9 is a perspective view of the carriage spring adjustment mechanism.

FIG. 10A is a perspective view of a pulley assembly in a first position.

FIG. 10B is a perspective view of a pulley assembly in a second position.

DETAILED DESCRIPTION OF EMBODIMENT- Three Mode Folding Reformer

Referring now to FIG. 1, which is a perspective view of an extended reformer in an unfolded position, the reformer includes a carriage **300** which slides on wheels which travel along a right rail and a left rail. The right rail comprises a right foot side rail section **200** which is attached by a hinge to a right head side rail section **201.** The left rail comprises a left foot side rail section **202** which is attached by a hinge to a left head side rail section **203.** The device may be folded at the hinges so that the rail sections stand generally upright. In this example, when the device is folded as illustrated in FIG. 2, the top of the head rail sections are generally upright, and the bottom of the foot rail sections abut the head base assembly **90** of the reformer.

The current embodiment is a commercial duty design such as would typically be used in exercise studios. The folding design is useful to permit alternative uses of floor space in the studio, and to facilitate transport of the device by rolling it to another location. In this example, a counterbalance mechanism is provided in order to help offset the weight of the machine while folding or unfolding the device. A torsion spring counterbalance mechanism permits one person to fold the machine by applying a lifting force of about 25 pounds of force to a lift handle.

Frame

In this example, the frame includes rail sections, a head cross member and a foot cross member between the rail sections, a head base support, and a foot end base assembly. The frame may also include a lift handle which may extend from the right side rail to the left side rail and provide additional support for the frame.

Referring now to FIG. 3, which is a perspective view of the left side rail assembly, the frame sections **202,** and **203** are preferably extruded aluminum. The extrusion has a general C-shaped cross section, with an internal bottom wall **226,** a side wall **230,** and a top wall **231** that

create cavities including a bottom cavity **227**, a side cavity **228**, and a top cavity **229**. The cavities provide a space for inserting reinforcement elements, alignment plates, and nut plates. The bottom wall **226** serves as a wheel rail for supporting the carriage wheels **340** (not shown), and the side wall **230** serves as a guide for carriage horizontal wheels **343** (not shown).

Referring now to FIG. 5, a head cross member **96** is mounted between the left and right head side rail sections. The head cross member **96** includes a left head cross member flange **96a** and a right head cross member flange **96b**. Each flange includes a curvilinear slot **520** with a rest position conic stop **521** and a folded position conic stop **522** which are part of a frame locking mechanism. The foot cross member **185** is mounted between the left and right foot side rail sections. The foot cross member includes foot board insert holes **187** and foot cross member wheel brackets **188**.

Hinge and alignment

Referring to FIG. 3. in this embodiment, alignment of the left head end side rail **203** and the left foot end side rail **202** is accomplished with a heavy-duty middle hinge **240** attached to the side rail sections with hinge mounting bolts **242** to a nut plate **249** positioned in the bottom cavity **227** of the rail sections, and by alignment plates inserted in the rail sections. The alignment plates include a male rail alignment plate **251** (not shown) with two rounded pegs, and a female rail alignment plate **252** with holes corresponding to the rounded pegs. In the unfolded state, the pegs engage the holes so as to laterally align the extrusions.

In order to align the rolling surface bottom wall **226** of the side rail sections, one or more shims **248** (not shown) may be inserted under a portion of the hinge. The right head end side rail and right foot end side rail sections are hinged in a similar manner. Referring again to FIG. 2, the joints between the rail sections are covered with a decorative strip **247**. A lift handle **250**, which also serves to maintain the width between the side rails, is attached between the left and right foot rail sections. In other embodiments, the lift handle may not extend between the left and right foot rail sections.

The shimming between the hinge and the rail's bottom surface insures that the rail sections are installed so that the bottom wall wheel track **226** is flat and the carriage wheels can roll smoothly over the hinge joint. In manufacturing the device, the distance from the hinge mounting surface to the rolling surface is measured for each extrusion pair of head and foot rail sections. Shims are placed as required to insure that the two rolling surfaces are flat.

Head base

The head end base provides several functions including supporting the machine, providing ballast to resist tipping, holding the arbor for the torsion spring, providing a rail locking mechanism to prevent undesired rail rotation, and supporting the poles.

Referring now to FIG. 4 which is a perspective view of the head base, and to FIG. 5 which is a detail view of the head cross brace, the head base assembly **90** includes a frame **91** comprising a head base u-shape footing **92** which has a left foot member **92a**, a right foot member **92b**, a head base lateral member **93**, a right vertical support **94**, a left vertical support **95**. In this embodiment, a lateral member **97** is provided between the left foot member **92a** and the right foot member **92b**. Head base levelers **98** are provided on the left and right foot members **92a** and **92b** in order to level the machine. In this embodiment, the frame elements are welded or bolted together. In an alternate embodiment, the frame **91** may be cast as a single piece which includes the u-shape footing, the vertical supports, and the cross brace. Two swiveling caster wheels **105** are mounted under the head base lateral member **93**. Weights are typically mounted within portions of the lateral member **97** and the head base lateral member **93**. Stiffening plates are typically mounted in the left and right foot members **92a** and **92b** in order to support the left and right vertical supports **95** and **94**. The vertical supports may be partially covered by decorative support covers **99a** and **99b**.

Counterbalance mechanism

In this example, a counterbalance is provided during folding and unfolding by a pair of torsion springs **271**. Alternately, other counter balance devices familiar to those skilled in the art may be used, such as a single spring, one or more gas cylinders, or a cable and weight pulley mechanism. Referring now to FIG. 6 which is a perspective view of the right torsion spring, the right torsion spring **271b** is mounted on a torsion spring support bar **131** between flange **96b** on the head end rail cross member **96** and torsion spring retention collar **272** which is adjustably fixed to the torsion spring support bar. The head end rail cross member and its flanges pivot in relation to the torsion spring support bar **131**. The torsion spring support bar passes through a bushing **134** mounted in the flange **96b**, and is retained by torsion spring bar retainer bracket **132** positioned on the right vertical supports **94** of the head end base assembly **90**. The end **135** (not shown) of the torsion spring support bar is shaped with machined flats so that the end of the bar

fits into u-shaped torsion spring bar retainer bracket **132**. Torsion spring bar retainer bracket screw **133** is used to secure the bracket to the bar. In this embodiment, the left torsion spring assembly is symmetrical to the right torsion spring assembly. The torsion springs are designed to apply a torque to the side rails in order to assist in folding the machine.

Rail locking mechanism

In this embodiment, the right and left head rail sections are attached to the head end cross member **96**, which includes a right flange **96a** and a left flange **96b**. The head rail sections and the cross member pivot on the torsion support bar. A rail locking mechanism is provided such that when the locking mechanism is engaged, the pivotal connection becomes rigid. When the rail locking mechanism is disengaged, the left head side rail section **203** and right head side rail section **201** may be rotated about the torsion spring support shaft. In this embodiment, the locking is accomplished by engaging cone shaped male elements into corresponding female elements.

Referring to FIG. 6, in this embodiment, the rail locking mechanism **505** includes a right and a left portion which extend through curvilinear slots **520** provided on both the right flange **96b** and left flange **96a** of the head end cross member **96**. The frame locking shaft then passes through holes in the right vertical support **94** and the left vertical support **95** of the head end base. The curvilinear slots allow the head end rail cross member **96** to rotate about the torsion spring support bar **131** even as the frame locking shaft extends through the head end flanges. The frame locking shaft **506** has a frame locking shaft right side **510**, a frame locking shaft left side **560** (not shown), and a locking shaft coupler **530** (not shown).

The curvilinear slot **520** located in the right flange **96b** of the head end rail cross member includes a rest position conic stop **521** and a folded position conic stop **522** which are cone-shaped through holes located at each end of the slot. These conic stop features provide the female portion for the right side rail locks. A frame locking shaft right side **510** is inserted through the curvilinear slot **520** in the right flange of the head end rail cross member and subsequently through a hole in the right vertical support **94**. The right side shaft is retained by a right shaft bracket **550** which includes a bushing **552** and a threaded portion **551** (not shown). The frame locking shaft right side **510** includes a cone stop section **511** which engages either the rest position conic stop **521** or the folded position conic stop **522**; a smooth section **512** which may pass through the curvilinear slot **520**, a threaded section **513** (not shown) which may be

threaded through the threaded portion **551** of the right shaft bracket **550** , and an extension section **514** which passes through the right shaft bracket. A right knob **540** (not shown) is provided on the extension section **514** so that the knob may be turned in order to tighten the frame locking shaft right side by threading the threaded section **513** (not shown) into the threaded portion **551** of the right shaft bracket **550**. As the shaft is threaded into the bracket, the cone stop section **511** engages the rest position conic stop **521** or the folded position conic stop **522**. The right knob **540** may be turned in the opposite direction to release the rail locking mechanism.

A similar arrangement is provided on the left side, except that left side shaft passes through a hole in the left head end base vertical support and the cone stop section engages a female counterpart on the outside edge of the left head end cross member flange. As either the right knob or the left knob is tightened, the right side threads engage the threads in the bracket and pull the bar laterally to the right so that the male cone shaped elements will engage the female elements in the right and left vertical supports.

When the male and female elements are engaged, the mechanism is locked either in a resting unfolded position or a folded position. As described more fully below, in order to fold the machine, either of the knobs is turned to disengage the cone stops from the rest position conic stops; the machine is folded; and then either knob is turned to engage the cone stops in the folded position conic stops.

The frame locking shaft provides a first locking function of holding the machine in an unfolded state during exercises, and a second locking function of holding the rails in a folded state. Alternative locking means include friction plates, a detent pin and locating hole mechanism, a face gear tooth lock, and other mechanical locking mechanisms known to those skilled in the art.

Foot Base

As illustrated in FIGs. 1, 2 and 5, the foot cross member **185** and the foot base support **184** which supports the foot end of the frame. The foot base support **184** includes a pair of foot base wheels **183**, a foot cross member **185** attached to the left and right foot side rail sections, and a footbar assembly **470**. The foot cross member **185** includes an integral standing platform **450** which includes two kick board insert holes **187**. A user may stand on the standing platform **450** while performing standing exercises. The foot cross member **185** includes a pair of foot cross member wheels **186** as described more fully in the folding discussion below.

When the folding operation is initiated, the foot end rolls toward the head end on the foot base wheels **183**. Once the foot end rail sections reach a predetermined angle, the rolling surface transitions from the foot base wheels **183** to the foot cross member wheels **186**.

Footbar assembly

FIG. 7A and 7B are perspective and side views of the footbar assembly **470** which includes a u-shaped footbar **471**. The footbar pivots on each foot side rail section with a footbar pivot **472**. In this embodiment, an h-shaped footbar support bar **474** is attached to the footbar. Two of the legs of the 'H' are shortened. The footbar support bar includes a slot **475** at the end of each of the shortened legs **473a** and **473b** of the bar. The slot can be positioned over any one of three round pins **477** located in a footbar adjustment bracket **476** foot end rail cross member in order to place the footbar at various angles with respect to the side rails. The slot located at the end of each of the shortened legs of the footbar support bar is shaped in such a way as to prevent the footbar support bar, once engaged, from disengaging from its respective pin regardless of whether the footbar is pushed or pulled. To disengage the slot from its pin, the footbar support bar is rotated until the slot is removed from the pin. When folding the device, or when converting the device to a mat mode, the footbar support bar **474** is removed from the adjustment bracket **476**, and the support bar and footbar may be pivoted out of the way.

Carriage

Referring now to FIGs. 8A and 8B, in this embodiment, the carriage is made of two large, flat hinged portions so that it can be unfolded as discussed below. The carriage **300** is shown in a folded position such that a carriage mat **301** faces upward. A user typically sits or lies on the carriage mat while performing exercises in the reformer mode as discussed in more detail below.

In order to convert the reformer to a mat mode, the carriage is moved to the head end of the machine, unfolded and mats are placed across the top of the side rails. In this example, the carriage includes a carriage upper portion **304** which is attached by a carriage hinge **306** to a carriage bottom portion **305**. A hook and loop, or other fastening means may be used to hold the carriage upper portion **304** and the carriage bottom portion **305** together when the device is folded upright.

In the unfolded mode, a first mat **307** (not shown) and a second mat **308** (not shown) may be placed over the side rails in order to provide a flat padded surface for using the device in a mat mode. The first mat and second mat preferably have a frame with several cross members, each cross member having a concave right and left edge that conforms to the upper portion of the side rails. The two parts of the mat can also be hinged. In another embodiment, the sides of the carriage top portion and the carriage bottom portion that face each other when the carriage is folded can both be upholstered. When the carriage is unfolded, the padded surface will be exposed for exercise. In this embodiment, an additional upholstered piece would be added if the exerciser requires that the entire surface of the reformer may be covered with mats. In an alternate embodiment, the unfolded carriage may have exposed pads to provide for mat exercises.

The top surface of the carriage includes a headrest **311** which is hinged with a head rest hinge **322** so that it can adjust to lie flat or incline with respect to the carriage surface. A shoulder pad **323** is located on each side of the headrest. A handgrip **325** is located between the shoulder pad and the head end of the carriage. The handgrip base **326** is preferably built up in thickness so that a short/long box **600** (not shown) may rest on the upholstered portion of the carriage and on the handgrip base to provide a wide support to stabilize the short/long box. The short/long box is described more fully below.

The top of the carriage also includes rope cleats **335** for securing a desired length of rope from the pole system as described more fully below. Once the desired rope length is selected, the rope **337** is pressed into the rope cleat **335**, which may be a sailboat cleat. Excess rope may be placed through rope clearance holes **338** (not shown) located on either side of the top of the carriage toward the foot end from the cleats. The excess rope passes through the hole and is stored under of the carriage.

Rollers

FIG. 8B, is a perspective view of the underside of the carriage assembly. The carriage rides on four platform wheels **340** which travel in a channel on the wheel rails **226** of the side rail sections. The wheel axles **341** are attached to the carriage with brackets **342**. In addition to the main rollers, a set of four horizontal wheels **343** is provided. The horizontal wheels are mounted to the carriage by roller brackets **344**. These rollers help to keep the carriage aligned with respect to the side rail side walls **230**.

Springs and Gear change mechanism

The resistance to moving the carriage is provided by a plurality of interchangeable and detachable springs **429**. The springs may have different spring rates so that various overall resistances may be obtained by using different combinations of springs. One end of the springs is bent in a partially circular hook shape **429a** and is attached to the carriage by engaging the hook into a hole **351** located in the carriage spring attachment angle member **350**, and the other end is attached to a gear change mechanism as described below.

Referring again to FIG. 1, the distance from the carriage platform **309** to the footbar **471** at the foot of the frame is controlled by a carriage position adjustment assembly **425** which permits change of the location of a carriage spring anchor bar **430** relative to the left and right foot side rail sections. The carriage spring anchor bar typically has multiple, interchangeable tension springs attached to it. In this embodiment, the carriage spring anchor bar includes an internal bar and an elliptical tube cover. A plurality of eye bolts **433** (not shown) are threaded into the anchor bar so that the user may attach the free end of the spring to an eye bolt. In an alternative embodiment, the carriage springs may be attached by other means such as to slots **432** in a slotted mounting plate **431** integral to the carriage spring anchor bar as illustrated in FIG. 9.

In this embodiment, the carriage may be positioned at one of four preset positions relative to the foot end of the frame. The positions are noted as "3", "2", "1", and "-1" , with the larger numbers being further from the foot end of the frame. The carriage spring anchor bar **430** may be set at any of these positions. The carriage spring adjustment mechanism described below is also referred to as a gear change mechanism.

Each end of the carriage spring anchor bar **430** terminates at a carriage spring bar adjustment block **435** which slides in a respective adjustment C channel **446** assembled inside of the foot end rails and may be secured in one of the noted positions. The adjustment C-channel **446** has an upper longitudinal guide slot **447** with an axis parallel to the rear side rail, and a lower positioning plate **448** with a plurality of laterally disposed slots **449** that accept a locating pin.

The following is a description of the left block and its alignment mechanism, which is symmetric to the right block and its alignment mechanism. The left block slides on a lower positioning plate **448** which is part of the adjustment C channel **446** and is positioned in the left foot side rail **202**. The carriage spring bar adjustment block **435** has a locating pin **436** inserted

into its bottom surface. The adjustment C-channel includes a plurality of laterally disposed slots **449** that accept the locating pin **436**. The lateral slots compensate for a slight tolerance in the exact position of the locating pin and in the distance between the foot end rails, while maintaining the spring attachment bar in perpendicular alignment with respect to the side rails.

Referring now to FIG. 9, The carriage spring bar adjustment block **435** has a first shoulder bolt **437** located toward the head of the apparatus, and a second shoulder bolt **439** with a second shoulder bolt bushing **440** located toward the foot of the apparatus. A first portion of the neck of the second shoulder bushing will fit into the guide slot, and a second portion will not fit into the guide slot. An adjustment C-channel **446** is provided in the channel of the left foot side rail **202**.

Referring now to FIG. 3, The adjustment C-channel **446** has an upper longitudinal guide slot **447** with an axis parallel to the left rear side rail. The first shoulder bolt **437** has a first diameter such that the diameter is smaller than width of the longitudinal slot, so that when the head edge of the carriage spring anchor bar **430** is tilted up, the first shoulder bolt **437** is tilted up through the longitudinal slot **447**. The second shoulder bolt bushing **440** has an upper portion whose diameter is smaller than the width of the slot, a lower portion whose diameter larger than the longitudinal slot **447** and a transition portion, so that as the carriage spring anchor bar **430** is tilted up it pivots on the foot end lower corner of the carriage spring anchor bar block and the rounded upper portion of the bushing allows the block to pivot without interfering with the underside of the top surface of the C channel. When the block is positioned at a desired location, the user releases the carriage spring anchor bar **430**, and the weight of the assembly pivots the carriage spring bar adjustment block **435** so that the locating pin **436** is inserted into a lateral slot **449** associated with the desired position, and the second shoulder bolt **439** is inserted further into the longitudinal slot **447**. If a spring is left attached to the adjustment mechanism, the spring will also assist in pivoting the carriage spring bar adjustment block **435**. A symmetrical arrangement is used on the right side of the carriage spring attachment bar **430**.

The gear change mechanism and method, also called the carriage spring adjustment mechanism and method, are defined as "single hand operation" mechanism or methods because they can be accomplished by the user with one hand. A second hand is not required in order to release and move the carriage spring anchor bar, and a single reversible action- lifting the bar- is all that is required to release bar.

Referring now to FIG. 8B, the carriage is maintained at a set distance away from the carriage spring anchor bar **430** at each side rail by an assembly which includes a carriage stop **442** attached to at least the underneath right or left side of the carriage with a carriage stop mounting bracket **443**. Each carriage stop includes a shock absorbing bumper **445**, such as a rubber bumper or spring plunger, mounted on an extension **444**. The bumpers come into contact with the head end face of the carriage spring bar adjustment block when the carriage is in its retracted position, thereby maintaining a minimum distance between the carriage and the carriage spring attachment bar.

To actuate the gear change mechanism, the user rocks the spring or head end of the carriage spring attachment bar upward, thereby disengaging the locating pins **436** from the lateral slots **449**. The right and left first shoulder bolts **437** pass through the longitudinal slots **447**. The carriage spring bar adjustment blocks **435** pivot on their rear, lower edges. The rounded shoulders of the rear second bushings enable the blocks to pivot without interference. The upper necks of the second bushings remain engaged in the longitudinal slot. Once the locating pins are disengaged from their lateral slots in the lower positioning plate **448**, the carriage spring attachment bar can be moved to its new position where the locating pins will again engage respective lateral slots.

To best execute a gear change, one of the exercise springs, preferably the middle spring, is left attached to the eye bolt on the carriage spring anchor bar and all other springs removed. The tension of the spring maintains contact between the two shock absorbing bumpers of the carriage and the carriage spring bar adjustment blocks. As the carriage spring bar is moved, the bar and the carriage remain parallel, perpendicular to the axis of the longitudinal slot and racking or binding of the carriage spring adjustment bar as it is adjusted is avoided. The spring also provides a force to assist to re-engage the locating pins of the carriage spring bar adjustment blocks **435** to their respective lateral slots.

In this embodiment, changing gears can be accomplished as a single handed operation with a relatively simple and light weight mechanism. The spring attachment bar may have shapes other that shown in FIG. 9.

Risers & pulleys

Referring again to FIG. 1, in this embodiment, a pole system **110** is provided on the head end of the machine. The pole system includes a left base pole **111a** and a right base pole **111b**, a

left riser extension **112a** and a right riser extension **112b**, and a cap section **129** which connects the right and the left riser extensions. In this embodiment the base poles, riser, and cap section **129** are constructed of extruded aluminum with an elliptical cross section shape. The top aluminum piece is bent into a rounded U-shape to act as a cap **129** for the pole system. The major axis of the elliptical tube runs parallel to the length of the machine. A channel **128** (not shown) is extruded on the inside surface of the base pole and riser extension elliptical tubes only.

The poles typically support pulley assemblies **179**, eye bolts **124**, and a push-through bar **125**. The eye-bolts **124** are used for attaching springs for various exercises. Ropes **337** (not shown) are used with pulleys **154** in a variety of reformer and pole exercises.

Referring now to FIG. 10A and 10B which are perspective views of the pulley assembly in a first position and a second position. The left and right pulley assemblies **179a** and **179b** include pulley support block handle **172** assembled to pulley support blocks **171** that engage the channel in the base poles. For instance, each pulley assembly may be positioned at a desired height above the carriage as indicated by the left pulley in FIG. 1 or positioned below the carriage as indicated by the right pulley in FIG. 1. The pulley height is adjusted by moving the pulley support blocks vertically within the channel. A pull pin assembly **175** is integral to each support block. The pull pin assembly includes a pin **176** designed to engage one of a plurality of holes located in a pulley height adjustment plate **177** (not shown) mounted within the channel. Self-lubricated plastic skid plates **178** are attached to each side of the pulley support blocks **171** to permit the blocks to smoothly slide in the channel. In order to change the pulley position, the pin of the pull pin assembly is pulled outwards, and the pulley support block is moved to a desired position, where the pin is released. Left and right scales indicating the location of the pulley support blocks are included to insure that both blocks are adjusted to the same height and to record the setting for each exercise. Once the setting is recorded, future set ups are easier and more time efficient.

The pulleys **154** are mounted to the pulley mounting brackets **152.** The mounting brackets are assembled to the pulley support block handles **172** with screws **161** that terminate in spherically shaped, plastic ball mounts **165** (not shown). The pulley mounting flanges and pulleys are able to swivel to remain in line with the application of force on the ropes. The plastic ball mounts **165** are placed in spherically shaped holes **174** in the pulley support block handles **172**, allowing the pulley mounting system to swivel and self-adjust commensurate with the angle of pull of the ropes. A spring **163** and washer **162** are located between each pulley bracket **152**

and the respective handle **172** of the riser. Each pulley handle **172** includes a slot **173** extending from the spherically shaped hole to the exposed end **172a** of the handle. The pulley, pulley mounting flange and pulley mounting screw can be oriented perpendicular to the machine rails providing the clearance necessary for the pulley support blocks and handles to be adjusted down below the surface of the rails. This position is required to execute certain exercises. A push-through bar **125**, also known as a pass-through bar, is provided between the pole extensions. The mounting height of the push through bar can be adjusted.

In some exercises, the user pulls the carriage toward the head of the reformer with straps or ropes that are wrapped around the pulleys **154**. One end of these ropes or straps typically includes a hand grip, and the other end is positioned in the retaining cleats **xxx** after wrapping the strap or rope around the pulleys.

Operation

This embodiment of the machine provides for 3 modes of operation- the reformer mode, the pole exercises, and mat exercises. In an alternate embodiment described below, the pole exercises are not supported. Adjustments on the machine include floor levelers **98** at the head base; pulley handle settings, push through bar height, carriage position, number of exercise springs engaged and footbar position. As described below the reformer may be folded for transport or to take up less room on an exercise floor.

Reformer mode

In one group of exercises, the user lies or sits on the carriage and pushes one or both feet against the footbar **470** which may be positioned into various angles with an adjustable support bar **474** and a mounting bracket **476**.

In another set of exercises, the user typically pulls the platform by means of a rope, cable or strap through pulleys **154** which are each adjustably mounted on the base poles **111**. The user pulls the straps through the pulleys while lying supine or prone, standing, or sitting on the carriage, facing back, front, or sideways, depending on the exercise.

In another set of exercises, a short/long box **600** may be placed over the side rails, preferably so that one edge of the box rests on the right and left hand grip bases **326**.

Pole exercises

Referring again to FIG. 1, additional Pilates exercises can be performed with the pole extensions **112** and the push through bar **125**.

Mat mode

In order to unfold the carriage to convert the device for mat work, the carriage spring adjustment bar is placed in position 3 – position closest to the head end of the machine. The upper portion **304** of the carriage **300** is lifted and rotated about its hinge **306** and positioned such that the headrest partially overlaps the carriage spring adjustment bar. After unfolding the carriage, a first mat **307** (not shown) and a second mat **308** (not shown) are placed over the side rails. The mats provide a large flat area on which mat work can be performed. The foot end mat includes a foot strap **478** used for certain exercises.

Folding

The folding sequence is executed by positioning the carriage, disengaging the rail locking mechanism, raising the lift bar until the head end pivots on its wheels, engaging the rail locking mechanism, continuing to either raise the lift bar or press the foot and head ends together until the foot section abuts the head base, and securing the device. The carriage is placed at the foot of the device. The carriage spring anchor bar **430** is placed in the -1 position closest to the foot end of the machine, preferably with at least one carriage spring attached.

The frame pivot locking shaft is disengaged by either turning the left hand locking shaft knob **580** counterclockwise or turning the right hand locking shaft knob **540** clockwise so that the male cone shaped elements are disengaged from their female cone shaped elements. The rails are lifted by raising the lifting bar **250** located proximate the center of the machine. The foot end of the machine will be pulled toward the head end by rolling on the foot end base wheels **183**. When the rear section has been folded to about half of its initial length, a second set of wheels **186** located on the foot cross member **185** touch the ground and the foot rail sections are folded while riding on that second set of wheels. The lifting bar is raised until the right and left head rail sections **200** and **203** come into contact with at the head end of the machine. The locking mechanism is again engaged by pushing the right handed locking shaft knob **540** in and turning clockwise, or pulling the left hand locking shaft knob **580** out and turning counterclockwise, thereby engaging the cone shaped elements in the folded rest position. The right and left foot rail sections are then pulled further toward the head end of the machine.

Since the foot rail sections are longer than the head rail sections, continuing to pull the foot rail sections further toward the head end of the machine will cause the head base assembly to tilt slightly toward the head end. The pair of leveling devices **98** prevent the machine from moving when it is in its unfolded condition. When the foot rail sections are pulled further toward the head end of the machine, the head base assembly tilts toward the head of the device, thus lifting the leveling devices off of the ground so that the head end may be moved on its wheels. A hook and loop fastening strap **491** (not shown) is used to hold the foot rail sections against the head base assembly.

Once the leveling devices are lifted and the hook and loop fastening strap or other fastening mechanism is engaged, the machine can be rolled on its head base caster wheels **105** and the foot base roller wheels **186**. The wheels located on the head base assembly are swivel type wheels, allowing the folded machine to be maneuvered into tight corners.

The device may be unfolded by undoing the fold strap **491**, disengaging the pivot shaft locking mechanism, and controlling the rate of gravitational lowering of the foot rail sections. When the unit is fully unfolded, the pivot frame locking mechanism is engaged.

Variations of the present invention will be apparent to those skilled in the art, and many of the elements described are equally suited for substitute elements. For instance, the rail shapes, the carriage shape, the head rest, the shoulder pads, the gear changing mechanism, the counterbalance mechanism, the rail locking mechanism, and the pulley support and adjustment mechanism, and other assemblies may be varied. These and other changes familiar to those skilled in the art are anticipated by this invention.

DETAILED DESCRIPTION OF EMBODIMENT- Two Mode Folding Reformer

In this embodiment, a pole system is not provided on the head end of the machine. The cap section **129** is inserted directly on the right base pole **111a** and the left base pole **111b**, rather than the riser extensions. The remainder of the machine is as described above.

DETAILED DESCRIPTION OF EMBODIMENT- Folding Reformer with locking mechanism

In this embodiment, a folding reformer is provided without a counterbalance mechanism or a pole system. A frame locking means is provided. The frame locking means may be a conical element mechanism similar to that described above, friction plates, a detent and pin

mechanism, a face gear tooth lock, or other mechanical locking mechanisms known to those skilled in the art.

DETAILED DESCRIPTION OF EMBODIMENT- Folding Reformer with pole system

In this embodiment, a folding reformer is provided without a counterbalance mechanism or a frame locking means. A pole system is provided. The pole system includes risers, pulley mounts, and a pull-through bar.

DETAILED DESCRIPTION OF EMBODIMENT- Folding Reformer with locking mechanism and pole system

In this embodiment, a folding reformer is provided without a counterbalance mechanism. A frame locking means and a pole system are provided. A frame locking means is provided. The frame locking means may be a conical element mechanism similar to that described above, friction plates, a detent and pin mechanism, a face gear tooth lock, or other mechanical locking mechanisms known to those skilled in the art. The pole system includes risers, pulley mounts, and a pull-through bar.

DETAILED DESCRIPTION OF EMBODIMENT- Alternate axial alignment for carriage position adjustment

In this embodiment, the carriage position mechanism for both foldable and fixed reformers includes an axial alignment component in addition to a longitudinal alignment component. The longitudinal alignment component sets the distance between the carriage and the footbar. The axial alignment component keeps the carriage spring anchor bar, or its equivalent t structure, in an alignment approximately perpendicular to the side rails, as the carriage position is changed. The axial alignment may be a pin and guide slot as described above, linear bearings and guide bar, blocks captured with channels, a telescoping mechanism, or other alignment method as known to those skilled in the art.